

Promoting Public Transportation: A Comparison of Passengers and Policies in Germany and the U.S.

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Abstract

It is often suggested the U.S. should adopt policies similar to European countries to increase public transportation ridership and the sustainability of the transport system. Based on two national travel surveys, this paper compares socioeconomic and geographic characteristics of public transportation riders in both countries and then analyzes differences in public transportation policies in Germany and the U.S. Dissimilar policies can help account for variability in ridership not explained by socioeconomic and geographic differences.

In both countries public transportation ridership increases with population density, metropolitan area size and decreases with rising income, car ownership, and household distance from a public transportation stop. However, supported by better policies German public transportation systems are able to attract more riders from all groups of society. For example, Germans living in households with more cars than drivers make a three times higher share of their trips by public transportation than the average American. Even Germans in rural areas use public transportation more often than Americans in metropolitan areas. Compared to Germany, public transportation in the U.S. is (1) limited to dense areas in large urban regions; (2) centered around buses (65% of trips); and (3) mainly attracts poorer residents with less access to a vehicle and who live close to a public transportation stop.

Compared to the U.S., public transportation systems in Germany are characterized by (1) a longer history and more efficient use of government subsidies; (2) higher levels and better quality of public transportation supply; (3) better regional integration of public transportation services; (4) more multi-modal coordination; and (5) more favorable land use and restrictive automobile policies discouraging car use. Improving public transportation service in the U.S. could help augment public transportation's appeal and increase ridership among all groups of society in all spatial development patterns.

1. Promoting Public transportation for Increased Sustainability

Since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 the U.S. government has made renewed efforts to promote public transportation. With political will and funding for promoting public transportation in place, U.S. governments and public transportation agencies need to develop programs, policies, and strategies that can help improve public transportation's operation, increase its competitiveness, and attract more passengers. A better utilized and more efficient public transportation system can help enhance accessibility for all, reduce energy use per public transportation trip and passenger mile, increase financial efficiency, and thus contribute to a more environmentally friendly, equitable, and financially sound transportation system.

A look across the Atlantic to Germany can help identify successful policies to improve public transportation service and increase ridership. Germany is heralded as one of Europe's prime examples for promoting public transportation through regionally integrated timetables and fare structures, as well as high levels of service with modern, attractive rolling stock (Cervero, 1998; Pucher & Kurth, 1996; Vuchic, 1999). In Germany 8% of all trips are made by public transportation compared to only 1.6% in the U.S. (BMVBS, 2004; ORNL, 2005). Moreover, compared to Germany, U.S. light rail and bus systems use nearly twice as much energy per passenger kilometer (2.5 vs. 1.3 Mega Joule) and government subsidies per public transportation passenger kilometer are two times higher (\$0.4 vs. \$0.2) (APTA, 2006b; DOE, 2007; UBA, 2005; VDV, 2006).

It is often suggested the U.S. adopt strategies similar to successful European countries to upgrade its public transportation service, increase ridership, and thus improve financial and environmental sustainability (Pucher & Cholorer, 1998; Pucher & Kurth, 1995; TRB, 2001). Relatively little is known about the differences between public transportation riders in European countries and the U.S. Based on two uniquely comparable national travel surveys, this paper investigates differences and similarities in public transportation use in Germany and the U.S. This benchmarking effort controls for other factors that could explain differences in public transportation use, such as socioeconomic and demographic dimensions, spatial development patterns, household location and trip purpose. Understanding differences in public transportation ridership can help U.S. public transportation managers recognize the uniqueness of their system, detect current weaknesses, identify groups of potential future public transportation riders, and formulate policies to attract more passengers.

This paper proceeds as follows. First, trends in public transportation use over the last 40 years in both countries are highlighted; showing a history of robust decline in the U.S. and holding steady in Germany. In the second section, two comparable national travel surveys are introduced, showing similarity in survey methods and data. The third part of this paper analyzes differences and similarities in public transportation ridership based on the two datasets. The fourth part summarizes and categorizes differences in public transportation policies between the countries. This section is based on a literature review, recent government and public transportation agency documents as well as personal communication. Finally, a concluding section summarizes key differences in public transportation policies and provides lessons for

U.S. public transportation managers and policy makers. There is good news for the U.S., public transportation policies help explain greater public transportation use in Germany, even after controlling for socioeconomic factors and spatial development patterns.

2. Trends in Public Transportation Demand

Over the last 40 years the annual number of public transportation riders increased in both countries. However, adjusting for population growth the average number of linked public transportation trips per inhabitant in the U.S. declined slightly from 23 in 1970 to 21 in 2005. Germany on the other hand witnessed a 15% increase in linked public transportation trips per capita over the same time period (see Table 1). In 2005, an average German made six times more trips and traveled four times more kilometers on public transportation per year than an American. Some readers might think that the recent increase in public transportation ridership in Germany could be related to German reunification in 1990 and higher levels of public transportation use in the formerly socialist East. This is not the case, however. Since reunification public transportation patronage dropped by over 20% in eastern Germany, but increased by more than 13% in the western part of the country. Since 2001, the public transportation mode splits in east and west German cities are about the same (Broeg & Erl, 2003; Staedtepegel, 2003).

TABLE 1 ABOUT HERE

Over the last 40 years, automobile use in both countries grew even faster than public transportation ridership, resulting in a decline in the percentage of all trips made by public transportation. According to the latest U.S. national travel survey the share of trips by public transportation declined from 2.6% in 1976 to 1.6% in 2001. For Germany the evidence is mixed. The national travel survey shows a decline of the percentage share of public transportation from 12.0% of all trips in 1976 to 8.0% in 2002. However, the latest survey in this series has been criticized for underreporting public transportation trips—due to a new phone based survey design, which supposedly oversampled homemakers who are less likely to use public transportation (Broeg, 2004). Indeed, other credible German sources show a stable public transportation mode share of roughly 11% since 1976 (BMVBS, 1991-2008). No matter, which statistic is more accurate, in 2001 Germans used public transportation for at least five times more trips than Americans. Country and city wide data hide variability in public transportation use, which is important to understand factors influencing public transportation ridership. The next section focuses on socioeconomic, demographic, and geographical differences in public transportation ridership.

3. Data Source: Two Uniquely Comparable National Travel Surveys

Two national travel surveys, the *National Household Travel Survey 2001 (NHTS)* for the U.S. and the *Mobility in Germany 2002 (MiD)*, are the main data sources for this comparison. Both surveys are based on similar data collection methods and contain comparable variables. Similarities and differences of the two surveys are summarized in Table 2. Cells shaded in grey indicate comparability between the two surveys; cells in white display remaining differences. These two surveys are the most comparable national travel surveys that currently exist. In fact,

prior to designing their survey the German head researcher spent a year at the Oak Ridge National Laboratories to study the U.S. national survey.

TABLE 2 ABOUT HERE

The data allow a detailed investigation of the role of socioeconomic factors, spatial development patterns, and policies to explain similarities and differences of public transportation use. Some variables for the analysis were readily available for comparison in both datasets and simply had to be transformed to make them fully comparable; other variables had to be added.

If not indicated differently, public transportation in this paper refers to local and commuter buses, commuter trains, subways, elevated heavy rail, and street cars. For some comparisons school buses are also included in the analysis, but this will be specifically stated. The definition excludes intercity trains and buses, taxis, for-hire limousines, charter tour buses, hotel and airport shuttles, and ferries. Data for both countries are based on national samples of individuals and trips, excluding add-ons for particular states.

4. Who Rides Public Transportation in Germany and the U.S.?

Public transportation use is more common among Germans than Americans. About 13% of Germans ride public transportation daily and 25% use public transportation at least once a week—compared to only 9% of weekly public transportation riders in the US. The majority (54%) of Germans report riding public transportation at least once a year—compared to only 17% of Americans. The following paragraphs introduce some specific observations based on an analysis of the uniquely comparable NHTS and MiD survey data. Regardless of age, income, household car ownership, population density, metropolitan area size, household distance to a public transportation stop, and trip purpose Germans use public transportation more often than Americans. Transport policies that help explain dissimilar travel are introduced in section 5.

4.1 Socioeconomic and Demographic Characteristics of Public transportation Riders

German Public Transportation Attracts a Higher Share of Older Individuals

At all ages Germans use public transportation for at least twice as many trips as Americans, but the difference in public transportation ridership is greater for older individuals (Exhibit 1). Germans over 70 years old make almost 10% of their trips by public transportation, compared to 1% in the U.S. Combined with higher levels of walking and cycling, the German elderly make over 56% of trips without a car—compared to only 11% in the U.S.—contributing to higher levels of accessibility for German elderly who can no longer drive.

FIGURE 1 ABOUT HERE

Bus Riders are Poorer in the U.S.

As theory suggests, in both countries the share of trips by public transportation declines as income rises. Americans in the lowest income quartile make 3.1% of their trips by public transportation compared to only 1.0% in the highest income quartile. But public transportation use is three to six times higher for all income quartiles in Germany than in the U.S.: 9.6 and 6.7% of trips are made by public transportation for the first and last income quartiles in Germany respectively. Interestingly, even Germans in the highest income quartile make a higher share of

trips by public transportation than Americans in the lowest income quartile—suggesting that public transportation in Germany also attracts wealthier individuals.

In both countries, public transportation riders have lower than average household incomes. However, the difference in income is much less pronounced in Germany: \$43,600 median annual household income for public transportation riders vs. \$45,500 nationally; compared to \$42,500 vs. \$52,500 for the U.S. In spite of higher average incomes in the U.S., American public transportation riders are poorer than German public transportation users.

Income groups are also more evenly distributed over rail and bus public transportation in Germany than in the U.S. Passengers of both modes of public transportation have identical median annual household incomes in Germany (\$43,600), whereas median annual household incomes of rail public passengers in the U.S. are twice as high as for bus passengers (\$52,500 vs. \$22,500). In spite of lower average incomes in Germany, median annual incomes of bus passengers are nearly twice as high as in the U.S.

German Public Transportation Attracts More Individuals that Have Easy Access to a Car

As expected, in both countries public transportation riders own fewer cars per household driver than the average population. This difference is more pronounced in the U.S.: 0.40 vs. 1.07 cars per household driver compared to 0.49 vs. 0.70 in Germany. In spite of higher motorization levels in the U.S., American public transportation users own fewer cars than German passengers. In Germany, 4.5% of all trips made in households with more cars than drivers are by public transportation, compared to only 0.3% in the U.S.

In Germany car ownership per household driver is similar for bus and rail riders (0.52 for bus and 0.47 for rail), but there is a large gap in the U.S. (0.34 vs. 0.52)—indicating more captive bus riders there. Evidently, regular public transportation riders might choose to own fewer vehicles in both countries, but in the U.S. household incomes of bus riders are likely too low to afford automobile ownership and operating costs. Another explanation why buses in the U.S. struggle to attract wealthier riders might be related to travel speed. In 2001/2002, only about 10% of all bus trips in Germany were slower than 5km/h (door to door) compared to over 22% in the U.S. (BMVBS, 2004; ORNL, 2005).

A Higher Share of Public Transportation Trips by Bus in the U.S.

Furthermore, in the U.S., public transportation is more concentrated around buses than in Germany. In 2001/2002, roughly 65% of all public transportation trips in the U.S. were by bus compared to only 40% in Germany. If school buses are also considered, the share of bus trips of all public transportation trips increases to over 80% for the U.S. and 45% in Germany. In contrast to Germany, rail services in the U.S. are limited to a few large metropolitan areas and are almost non-existent in small metropolitan or rural areas. The next section investigates the geographic distribution of public transportation ridership.

4.2 Spatial Development Patterns

Germans in Low-Density Areas Ride Public Transportation Almost as Often as Americans in Dense Neighborhoods

As theory would lead us to expect, higher population densities are related to more public transportation use in both countries. However, at all population density categories Germans use public transportation for at least three times more trips than Americans (Figure 2). The differences are most pronounced in low density areas: Germans living at population densities of less than 1,000 people per square kilometer use public transportation 17 times more than Americans (5.1 vs. 0.3% of total trips). Moreover, only Americans in the highest population density category use public transportation more often than Germans in the lowest density category (12.9% vs. 5.1%).

FIGURE 2 ABOUT HERE

Public Transportation in the U.S. in Concentrated in Large Metropolitan Areas

In both countries public transportation ridership increases with metropolitan area size (Figure 3). In each metropolitan area size category Germans use public transportation for at least three times more trips than Americans. Even outside of metropolitan areas Germans make 5.0% of their trips by public transportation—a mode share that is not even reached in the largest U.S. metropolitan area size category. Moreover, in the U.S. public transportation is concentrated in a few large metropolitan areas such as New York, Chicago, San Francisco or Philadelphia. For example, in 2000 the share of work trips made by public transportation in New York City was 28% compared to less than 1% in the majority of other urbanized areas. Public transportation use is more homogeneous across German metropolitan areas.

FIGURE 3 ABOUT HERE

Germans Living Far Away from Public Transportation Ride More Often than Americans Living Close By

Roughly nine out of ten Germans live within 1km of a public transportation stop, compared to only 43% of Americans. One might expect that public transportation access explains most of the difference in public transportation ridership between Germany and the U.S. However, the differences in public transportation use described above hold even controlling for household distance from public transportation.

As theory suggests, households close to public transportation (within 400m) have the highest public transportation share in each country: 9.1% of all trips in Germany and 3.8% in the U.S. In both countries, households between 400 and 1000m of public transportation have lower mode shares for public transportation (5.5% and 0.7% of all trips). Germans living more than 1,000 meters from a public transportation stop ride public transportation for more than 5% of all trips compared to only 0.3% in the U.S. Moreover, in the U.S. over 80% of all public transportation trips are made by individuals residing within 400m of a public transportation stop, compared to only 65% in Germany. Clearly public transportation usage is more concentrated around public transportation stops in the U.S. This is likely explained by the lower level of public transportation service and accessibility by public transportation outside of urban areas in

the U.S., which makes public transportation service less attractive for individuals living farther away.

4.3 Trip Purpose: More Public Transportation Trips for Shopping and Leisure in Germany

Moreover, public transportation in the U.S. is more concentrated on the work trip than in Germany. In both countries public transportation has the highest mode share for the work trip: 10.4% in Germany and 3.3% in the U.S. However, Germans also make about 5% of their shopping and recreational trips by public transportation compared to only 1% in the U.S. Rail public transportation in the U.S. is especially geared towards commuting. The majority (51%) of all rail public transportation trips there are commuter trips, compared to only 32% in Germany.

Regardless of age, income, car ownership, spatial development pattern and trip purpose public transportation systems in Germany attract more riders than public transportation in America. The next section describes transport policies that might help account for differences in public transportation ridership that could not be explained by the socioeconomic or geographic variables presented above.

5. Differences in Transport Policies and Public transportation Supply Characteristics

Compared to the U.S., public transportation in Germany is characterized by (1) a longer history and more efficient use of government subsidies; (2) higher levels and better quality of public transportation supply; (3) better regional coordination and integration of public transportation services, timetables, financing, and tickets; (4) more multi-modal coordination with walking and cycling; and (5) more favorable land use and automobile restrictive policies that make car use less attractive and encourage public transportation ridership. Table 3 summarizes major differences in public transportation policies and supply in Germany and the U.S. based on an academic and government literature review and personal interviews. The sections below present more detail and analysis of this information.

TABLE 3 ABOUT HERE

Longer History and More Efficient Use of Subsidies in Germany

On all levels of government Germany has a longer history of subsidies for public transportation. German local governments have traditionally treated public transportation as a branch of municipal services and covered public transportation's losses through cross-subsidies from their profitable electric or water utility operations (Pucher & Chlorer, 1998; Pucher & Kurth, 1996; Pucher & Kurth, 1995; Van de Velde, 2003; Yago, 1984). Similar to the U.S., after World War II, public transportation providers in Germany—faced with pressure from increasing motorization and suburbanization—cut services, raised prices, and lost riders (Baron, 1995; Köhler, 1995; Yago, 1984). But overall, the practice of local cross-subsidies protected German public transportation systems from the massive disinvestment, fare increases, and service deterioration that plagued privately owned American systems in the 1950s and 1960s (Pucher & Chlorer, 1998; Yago, 1984). Additionally, since the passage of the “Federal Municipal Transport Finance Law (GFVG)” in 1967, the German Federal government has provided

dedicated funds to state and local governments for public transportation capital investments. In order to obtain GVFG funds, public transportation projects have to be included in local transportation plans, comply with spatial development goals, address the needs of disabled and elderly, and be partially funded through local matching funds (BMVBS, 2005). Originally, 60% of GVFG monies were used for local road projects, but over time the ratio shifted in favor of public transportation as more road funds became eligible for public transportation and local governments gained more flexibility to decide exactly how to use the money (BMVBS, 2005). Overall, slightly more than 50% of GVFG funds dispersed from 1967 to 2004 went towards public transportation (€31 of 57 billion (US \$39 of 71 billion)) (BMVBS, 2005).

Even though Germany subsidizes public transportation more heavily on a per capita basis than the U.S., financial aid per public transportation rider and passenger kilometer of public transportation use are 1.5 to 2 times higher in the U.S.; thus indicating a more efficient use of government funds in Germany. Moreover, German public transportation systems cover 60% of their operating budgets through their own fare box revenue, compared to only 35% in the U.S. One reason for the greater financial success of German public transportation is higher occupancy rates, with more than twice as many passengers per vehicle as in the U.S. (APTA, 2006a, 2006b; VDV, 2005). Another explanation might lie in the disbursement of public transportation subsidies. In Germany public transportation operating subsidies have been traditionally borne by municipalities (Rönnau, 2004; Rönnau, Schallaböck, Wolf, & Hüsing, 2002; Yago, 1984). The German federal government has only provided subsidies for capital investments and never operating subsidies (Bundesregierung, 1999; VDV, 2005). Thus German municipalities always had to keep operating costs in mind when expanding their systems. This was not the case in the U.S. where since the 1970s the U.S. Federal government subsidizes public transportation operation and capital investments. It is well documented that the skyrocketing Federal public transportation subsidies in the 1970s and 1980s in some cases contributed to wasteful spending and some inappropriate system expansions (Pickrell, 1992; J. Richmond, 2001; J. Richmond, 2001). Federal subsidies for public transportation operation in urban areas with more than 200,000 inhabitants have been officially discontinued since ISTEA. However, many public transportation providers in large urban areas use Federal capital subsidies for “preventative maintenance”, which is reported as operating subsidy in the National Public Transit Database (U.S. Department of Transportation, 2008).

More recent expansions of light rail and bus rapid public transportation systems in the U.S. seem more promising. But overall, the results of increased Federal funding for public transportation in the U.S. have been sobering. From 1970 to 2005, public transportation vehicle km of service increased by 140%, public transportation patronage rose by only 55% and the market share of public transportation has fallen to 1.6% of all trips (APTA, 2006b; ORNL, 2005).

5.1 Higher Levels and Better Quality of Public Transportation Supply in Germany

Public transportation service is not only more financially efficient but also more abundant in Germany than the U.S. In 2005, there were 57 vehicle kilometers of public transportation service per year per inhabitant in Germany compared to only 24 in the U.S. Roughly nine out of

ten Germans live within 1km of a public transportation stop, compared to only 43% of Americans.

Overall, German public transportation systems offer a higher level and superior quality of service than American public transportation systems. Rolling stock in Germany is generally newer, more attractive, safer, more comfortable, and bus stops and rail stations often provide real time information for passengers (Vuchic, 1999). Public transportation tickets and fare structures are also more attractive in Germany; with options like region-wide monthly passes, which offer steep discounts. In most metropolitan areas in Germany public transportation service is completely coordinated, allowing passengers to change between public transportation modes and operators with one integrated region-wide ticket (Pucher & Kurth, 1996; VDV, 2006; Vuchic, 1999). More recently, some German public transportation systems even allow passengers to buy their public transportation tickets via mobile phone, thus saving time at train stations when accessing or switching trains or buses.

Even though public transportation service in the U.S. has been improving, Germany is still far ahead. This is particularly true for bus services in Germany, which often receive priority treatment at intersections or through exclusive bus lanes (Pucher & Kurth, 1996; VDV, 2006; Vuchic, 1999). For example, in 2001/2002, only about 10% of all bus trips in Germany were slower than 5km/h compared to over 22% in the U.S. (BMVBS, 2004; ORNL, 2005). For both countries travel speeds rely on self-reported door to door travel times and have to be interpreted with caution, but the data hint at a much higher percentage of very slow bus trips in the U.S. This is especially important when considering that average car trips—the main competitor for many public transportation trips—are 25% faster in the U.S. than in Germany (41 vs. 32km/h) (BMVBS, 2004; ORNL, 2005). Bus speeds are likely to increase in the U.S. as more and more Bus Rapid Transit (BRT) systems are built and expanded in the U.S., but many (mainly inner city) bus services are still in deplorable condition.

5.2 Regional and Multi-Modal Coordination

Another reason for the greater success of German public transportation are regional public transportation authorities that plan public transportation services, integrate timetables and fares, distribute operating subsidies over different public transportation agencies, and assure a seamless public transportation system across metropolitan regions (Bundesregierung, 1999; Pucher & Chlorer, 1998; Pucher & Kurth, 1996). In 1967 the region of Hamburg was first in Germany to integrate planning, provision, and financing of public transportation services region-wide in a so-called “Verkehrsverbund”. Most other German cities and regions have followed suit. Since the 1990s virtually every metropolitan area in Germany has a Verkehrsverbund. Two regional public transportation authorities are especially remarkable: The *Verkehrsverbund Rhein Ruhr*, covering an area of over 7.5 million inhabitants and the *Verkehrsverbund Berlin Brandenburg* covering the entire land area of two German states. Virtually all regional public transportation authorities experienced increases in ridership (BMVBS, 1991-2008; Pucher & Chlorer, 1998; Pucher & Kurth, 1996; Pucher & Kurth, 1995). Recent evidence from the U.S. shows that metropolitan areas with integrated bus and rail networks have higher ridership levels and are more cost effective compared to other metropolitan areas (Brown & Thompson, 2008).

More recently, German states are emerging as a new level of integration and coordination of public transportation services. In the mid 1990s, the German Federal government ceased its long held control over state and local commuter rails. A new Federal law handed rail public transportation management and operation as well as financial resources to state and local governments (Bundesregierung, 1999; Scholz, 2006). Since then, all German states passed new transportation laws and founded state-wide public transportation organizations, responsible for coordination of public transportation in the state. All states introduced new coordinated timetables (Taktfahrplan) for rail public transportation with the goal to integrate all rail public transportation operations with local public transportation services and long distance rail (Bundesregierung, 1999; Scholz, 2006). Ticketing has also improved: virtually all German states now offer state-wide public transportation tickets for groups of up to five travelers. These tickets cost €30 per day and grant access to all regional and local public transportation systems in the state.

Since the late 1990s, municipalities and public transportation authorities are also legally obliged to issue calls for tender for all public transportation lines that do not operate at a profit (Bundesregierung, 1999; Van de Velde, 2003). Public transportation lines that do not require subsidies are excluded from this new law. In practice, calls for tender are rarely issued as municipalities still cross subsidize their public transportation service with profits from local energy and water utilities (Bundesregierung, 1999; Van de Velde, 2003). Overall, the recent changes in public transportation fostered privatization of some lines, increased competition, improved public transportation service and resulted in more attractive rolling stock.

Public transportation systems in Germany are also more successful in coordinating public transportation with non-motorized transportation (Pucher & Buehler, 2008). In both countries most public transportation riders reach their public transportation stops on foot or by bike. Extensive, safe and convenient walking and cycling networks in German cities facilitate public transportation use. Moreover, German public transportation systems allow bikes on trains and provide extensive bike parking facilities at rail stations and increasingly even at bus stops (Pucher & Buehler, 2008). For example, over the last decade German Railways introduced their new "Call a Bike" program in many large German cities (German Railways, 2007). Rental bikes are placed at train stations and at major intersections throughout the city. Anyone with a mobile phone and credit card can rent a bike by calling a phone number indicated on the bike and obtaining an access code. Cyclists are charged per minute of bike use and can leave the bike at a public transportation stop or major intersections near their destination.

5.3 Land-Use and Automobile Restrictive Policies

Sprawled spatial development patterns and government policies that make car use cheap and convenient are major obstacles for public transportation in the U.S. German land-use policies are much stricter than in the U.S. making new developments outside of already built-up areas difficult, allowing more mixed use and thus limiting urban sprawl (Buehler, 2008; Hirt, 2008; Schmidt & Buehler, 2007). Moreover, the German spatial planning system prescribes coordination of transportation planning and land use planning (BMVBS, 2008; Köhler, 1995; TRB, 2001). Local, regional and state spatial plans have to take transportation plans into account and vice versa. This integration of planning potentially allows the alignment of planning goals

and minimizes adverse impacts. In the U.S., Metropolitan Planning Organizations can serve as connectors of land use and transport planning, but they are often limited to a weak advisory role with no political power (Orfield, 2002). More recently new transit-oriented developments in the U.S. generate mixed-used and more compact developments around public transportation stops.

Compared to the U.S., public transportation in Germany also faces a more level playing field when competing with the automobile. All levels of government in the U.S. subsidize road transportation. In the U.S. highway user taxes and fees only account for 60% of roadway expenditure (Buehler, 2008). In Germany highway user taxes and fees are 2.5 times higher than roadway expenditures (Buehler, 2008). Most German cities have made car travel less attractive through a host of policies including traffic calming of virtually all residential neighborhoods and reduced and increasingly expensive car parking in city centers and neighborhoods. Additionally, in stark contrast to interstate highways in the U.S., German Autobahn's rarely penetrate urban areas, thus making car travel in cities slower and less convenient (TRB, 1998). Overall car travel speeds in Germany are 25% lower than in the U.S., thus making public transportation travel times more attractive compared to the automobile. Moreover, costs of automobile ownership and operation are nearly twice as high in Germany than in the U.S. Especially, much higher taxes on gasoline in Germany increase the out of pocket cost for car travel. In the U.S. gasoline taxes constitute 15% of the price at the pump compared to 60% in Germany. As of June 2008, one gallon of regular unleaded gasoline was slightly over \$ 9.00 in Germany compared to only \$ 4.50 in the U.S. (EIA., 2008). Higher ownership and operating costs make automobile travel less attractive in Germany. At the same time, steeply discounted region-wide monthly and annual public transportation tickets make public transportation financially more attractive for riders in Germany.

Overall, the German transport and land use policy environment is more conducive to public transportation use than the American and contributes to making public transportation appealing for all groups of society. The German policy approach is two-pronged: on the one hand public transportation policies pull people into public transportation; and on the other car restrictive policies push people out of their automobiles.

6. Conclusions

Over the last 40 years Germany and the U.S. experienced growth in motorization rates and increasing suburbanization. In this same period, Germany has been more successful in promoting public transportation. In 2001/2002, Germans made a five times higher share of their trips by public transportation (8.0 vs. 1.6% for Americans). Faced by increasing gasoline prices and negative externalities of a car-dependent transport system, U.S. policy makers promote public transportation as a sustainable mode of transport, and may be able to look to Germany for guidance on policies that had a positive influence on public transportation ridership.

This paper identified five major differences in transport policies. Compared to the U.S. public transportation in Germany is characterized by (1) a longer history and more efficient use of government subsidies; (2) higher levels and better quality of public transportation supply; (3) better regional coordination and integration of public transportation services, timetables, financing, and tickets; (4) more multi-modal coordination with walking and cycling; and (5)

more favorable land use and automobile restrictive policies that make car use less attractive and encourage public transportation ridership.

With these policies in place German public transportation systems are able to attract more riders from all groups of society and living at all population densities. The analysis has shown that Germans in rural areas ride public transportation more often than Americans in the largest metropolitan areas. Moreover, Germans in the highest income quartile use public transportation for more trips than the poorest Americans. In spite of higher average motorization levels and incomes in the U.S., American public transportation riders own fewer cars and have lower annual incomes than Germans. Compared to Germany, public transportation in the U.S. currently (1) focuses on large urban areas; (2) emphasizes buses over rail public transportation; (3) centers on dense areas; and (4) mainly attracts poorer residents with limited car access who live in the immediate vicinity of a public transportation stop.

If the U.S. were to implement the policies described in this paper public transportation might increase its appeal for all groups of society. In Germany, the combination of policy carrots that promote public transportation and policy sticks that make car use less attractive has been key to public transportation's success. In the U.S. it has traditionally been more difficult to break with the history of subsidies for automobile transportation. However, current trends in market prices of gasoline might help push people out of their cars and into public transportation. This might be a good time for public transportation systems to gain new riders by implementing smart policies and programs.

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		<u>1970</u>	<u>1980</u>	<u>1990*</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>
Public transportation ridership (million linked trips per year)	Germany	7,015	7,652	9,156	9,265	9,638	10,987
	U.S.	4,583	5,354	5,499	4,852	5,852	6,134
Linked public transportation trips per person per year	Germany	116	124	114	113	117	133
	U.S.	23	24	22	18	21	21
Annual public transportation passenger kilometers per inhabitant	Germany	1,002	1,063	963	1,060	1,104	1,145
	U.S.	n.a.	282	265	239	271	269
Percentage share of all trips by public transportation	Germany (I)	11.0**	12.0	10.0	10.5	10.7	11.4
	Germany (II)	12.0**	12.0	10.0	n.a	8.0***	n.a
	U.S.	2.6**	2.2	2.0	1.8	1.6	n.a

Table 1. Indicators of Public Transportation Use in Germany and the U.S., 1970-2005
(APTA, 2006b; BMVBS, 1991-2008; ORNL, 2005; Pucher & Lefevre, 1996; VDV, 2005)

*Data from 1990 onwards are for reunited Germany **Data for 1976. ***This survey has been criticised for underreporting public transportation trips.

	<i>Range of NTS</i>	<i>MiD (Germany)</i>	<i>NHTS (U.S.)</i>
<i>Survey Period</i>	<i>10 weeks to 14 months</i>	14 months (11/01 - 12/02)	14 months (03/01 - 04/02)
<i>Collection Rhythm</i>	<i>annually to irregularly</i>	76, '82, '89, '02	69, '77, '83, '90, '95, '01
<i>Sample Size</i>	<i>3,000 to 63,000 HH</i>	25,848 HH	26,082 HH
		61,729 individuals	60,228 individuals
		167,851 trips	248,512 trips
<i>Survey Method</i>	<i>phone, person, mail</i>	Computer Assisted Telephone Interview (95%; other 5% paper based)	Computer Assisted Telephone Interview (100%)
<i>Target Population</i>	<i>generally civilian population</i>	civilian	civilian
<i>Eligibility of HH Members</i>	<i>adults, children, age caps</i>	adults and children	adults and children
<i>Sampling Technique</i>	<i>RDD, population registry, or other lists</i>	stratified random sample from population register	list assisted random digit dialing
<i>Survey Period</i>	<i>1 to 7 days</i>	1 day travel diary	1 day travel diary
<i>Response Rates</i>	<i>often below 40% of HH</i>	42% of HH	41% of HH
<i>Inclusion Criteria</i>	<i>vary widely</i>	HH where at least 50% of HH members responded	HH where at least 50% of HH members over 18 years old responded
<i>Nonresponse Treatment</i>	<i>varies widely</i>	collection of HH data	collection of HH data
<i>Weights</i>	<i>vary widely</i>	selection reciprocal, non-response, HH size, weekday, month, regional characteristics	selection reciprocal, non-response, HH size, weekday, month, regional characteristics
<i>Data Level</i>	<i>HH, person, trip, or car</i>	HH, person, trip, car	HH, person, trip, car
<i>Representativeness</i>	<i>Country, regions, states, and other subsections</i>	Germany, States	U.S., Census Regions
<i>Add-ons</i>		Yes	Yes

Table 2. Potential Sources of Divergence in National Travel Surveys and Comparability of MID and NHTS (Kunert, et al., 2002)

	<i>Germany</i>	<i>U.S.</i>
Subsidies (operating and investment)	long history of subsidies for operation from local governments; federal government subsidies for investments since the 1960s	history of private ownership; federal government subsidies for operation and investments since 1970s; steep increase in federal subsidies for public transportation since ISTEA
Average annual public transportation subsidies since 2000	\$19 billion	\$28 billion
Average annual public transportation subsidy per inhabitant	\$230	\$94
Average public transportation subsidy per passenger trip	\$1.70	\$2.90
Average public transportation subsidy per passenger kilometer	\$0.20	\$0.40
Share of operating expenses covered by farebox revenue	60%	35%
Regional integration of public transportation services and financing	full coordination of operation and financing of public transportation in metropolitan areas through regional public transportation authorities (Verkehrsverbund) since the late 1960s	regional public transportation authorities exist in almost all cities, but with a much lower degree of coordination and integration of services than in Germany
Multi-modal coordination	integration of public transportation with walking and cycling through improvements in pedestrian and cycling facilities; thus making walking and cycling viable for trips to and from public transportation; seamless transfers between bus and rail; bike and car rental programs run by public transportation providers	some cities integrate their bus and rail services; Transit Oriented Developments (TOD) are designed to increase walking, cycling and public transportation use; over 60 of the largest public transportation providers offer guaranteed-ride-home programs
Region-wide fare integration across operators	almost all German city regions have regional public transportation authorities that integrate fares and time tables; more recently state-wide time table coordination and public transportation tickets	fares are rarely integrated across operators; fragmented provision of public transportation service with little integration of timetables
Discounts	many subsidized discounts for the elderly, school children, and other groups; monthly tickets with steep discounts per trip; tax benefit based on daily commute distance for all modes including public transportation	public transportation commuter tax benefits; discount monthly tickets for commuters, but not as steep and extensive as in Germany
Unified online information systems for users	users can access information about regional, state-wide, and even national public transportation routes, connections and fares online; real time information at most rail and light rail stops and on board of most trains and busses	fragmented information provision; real time information remains rare even on rail services; bus stops often even lack timetables
Vehicle km of public transportation service per person per year	over two times more vehicle km of public transportation service per capita in Germany than in the U.S. (57 vs. 24 in 2004)	
Bus lanes & traffic signal priority	most cities have special bus lanes and traffic signal priority for busses	over a dozen Bus Rapid Transit systems exist in the US; HOV lanes and shoulders give busses priority over cars

Table 3. Similarities and Differences of Public Transportation Policies in Germany and the U.S. (APTA, 2006a, 2006b, 2008; BMVBS, 1991-2008, 2005; Pucher & Kurth, 1995; VDV, 2002, 2005, 2006; Vuchic, 1999; Yago, 1984)

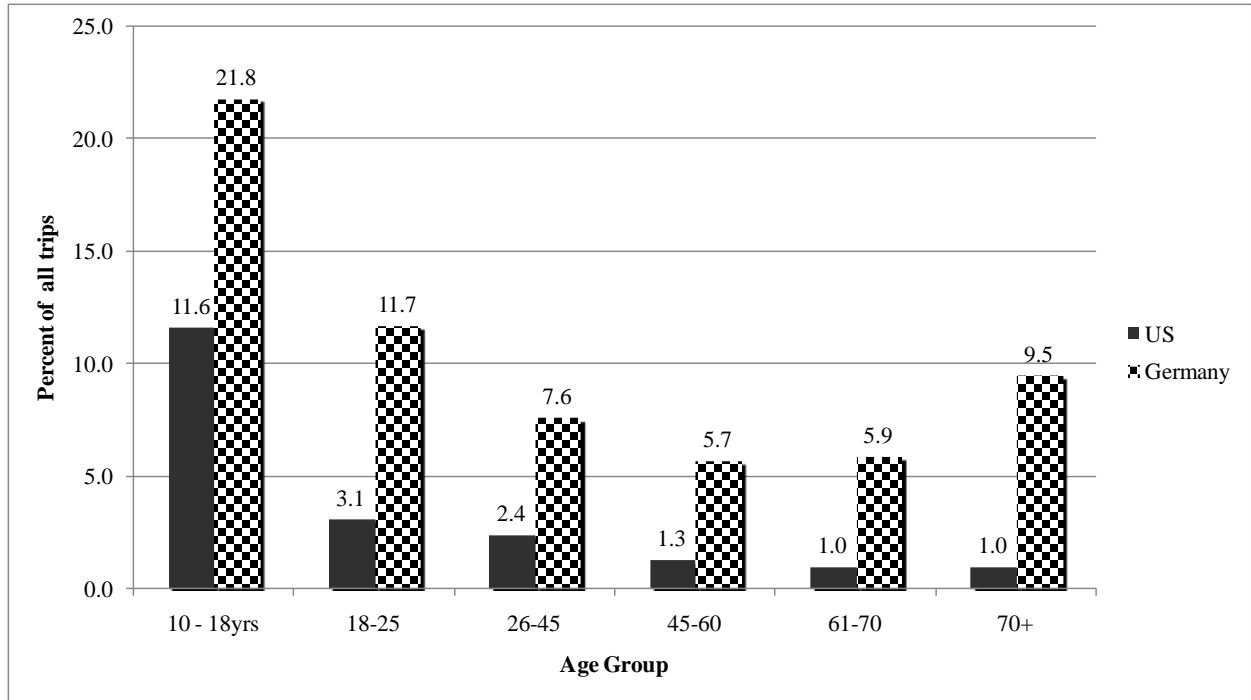


Figure 1. Percentage Share of Trips by Public Transportation in Germany and the U.S. by Age Group, 2001/2002

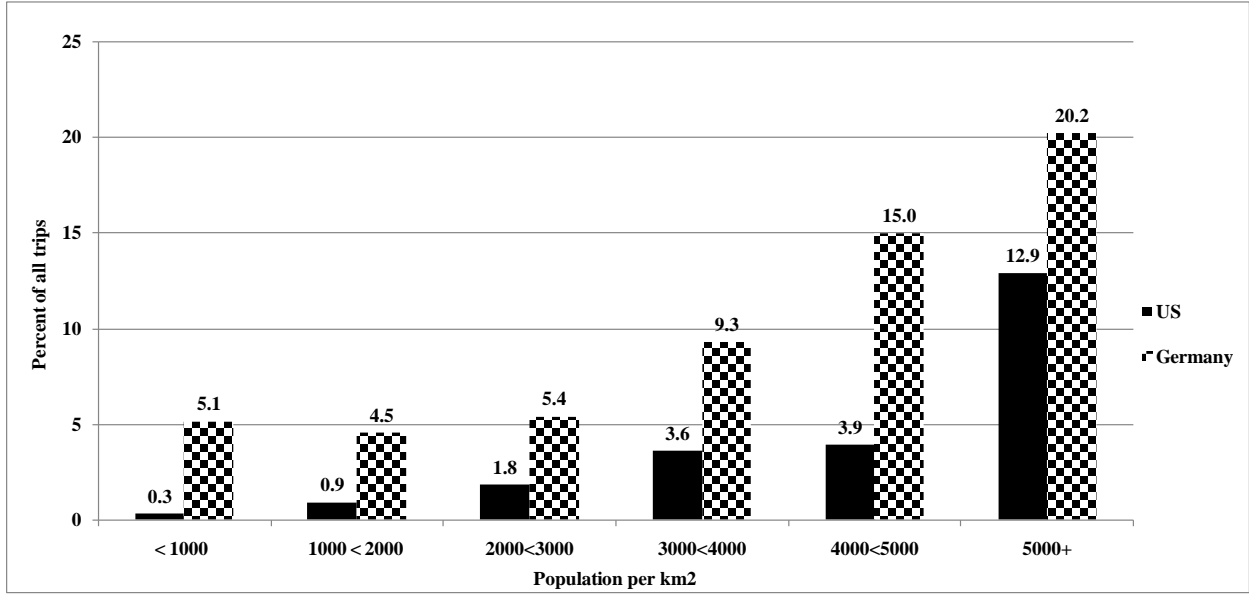


Figure 2. Percentage Share of Trips by Public Transportation in Germany and the U.S. by Population Density Category (population per km²) 2001/2002

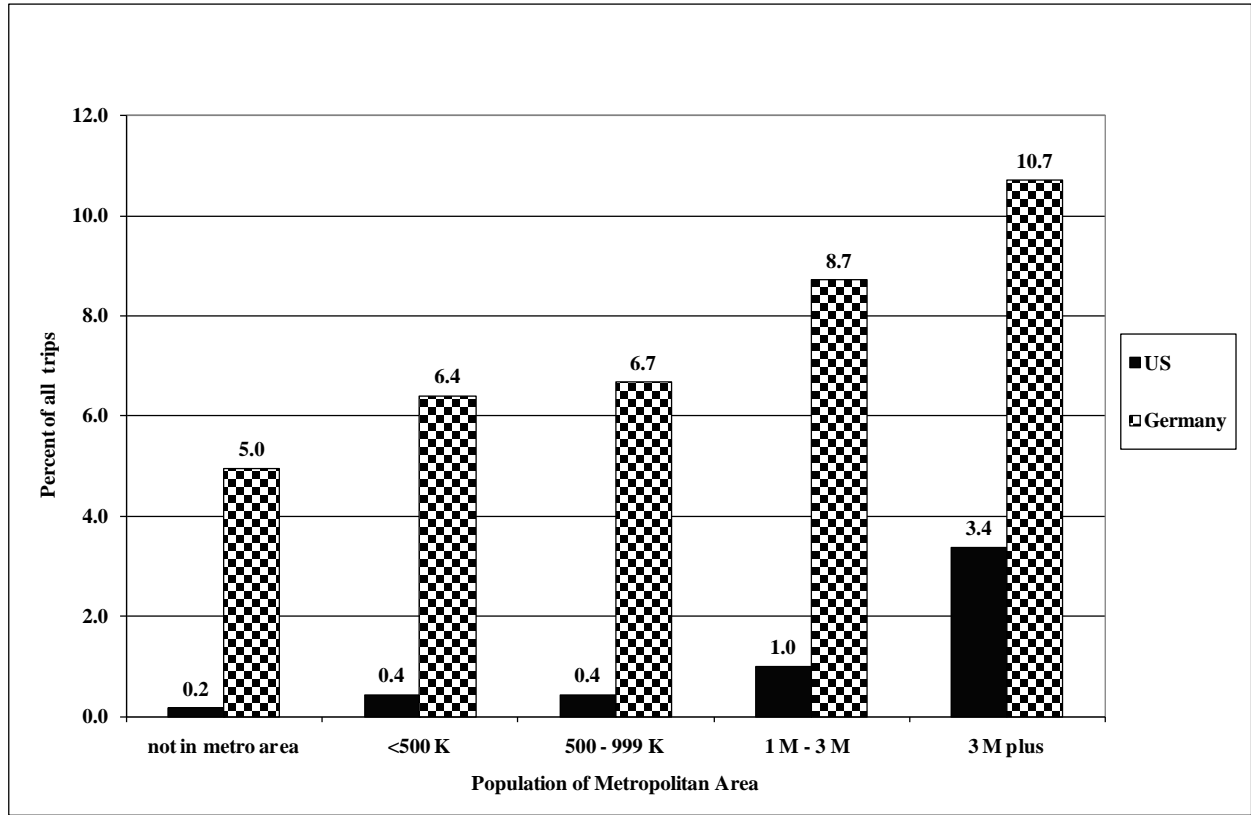


Figure 3. Percentage Share of Trips by Public Transportation in Germany and the U.S. by Metropolitan Area Size Category, 2001/2002